CLAIMS

1. A network forwarding device connecting a plurality of networks comprising:

a port to which one of said networks is connected;

a network interface connected to said port and controlling an interface with the network connected to said port; and

a routing processor connected to said network interface via an intra-device communication line and performing routing of a packet received from said network interface;

wherein said routing processor includes:

path information holding means; and

next-path searching means for calculating, based on path information held in said path information holding means, a path to which the received packet is to be forwarded next and

wherein, in a 2-branch tree search in which a destination address of the received packet is checked, one bit at a time beginning at a highest-order bit, said next-path searching means combines p (p is an integer equal to or larger than 2) levels into one 2^p-branch tree to perform a search of the p levels of the 2-branch tree as a one-level search.

2. The network forwarding device according to claim 1 wherein said next-path searching means combines a total of $(2^p - 1)$ 2-branch tree nodes, composed of one

2-branch tree node and immediately lower 2-branch tree nodes of (p-1) levels, into one said 2^p-tree node and, into the combined lowest-level $2^{(p-1)}$ 2-branch tree nodes, embeds path data allocated to higher-level nodes to form said 2^p-tree node with $2^{(p-1)}$ 2-branch tree nodes.

3. The network forwarding device according to claim 2 wherein, when combining a plurality of 2-branch trees, said next-path searching means has only one element if the element may be shared.

4. The network forwarding device according to claim 2 wherein said next-path searching means does not read a whole node when reading the 2^p-branch tree node but reads only data corresponding to one of the $2^{(p-1)}$ 2-branch tree nodes combined when the 2^p-tree node was created.

5. The network forwarding device according to claim 2 wherein said next-path searching means stores into each node, not a mask length of the node, but a mask length of a node immediately below the node, to find the node mask length before reading data of the node and selects a part of the node data to be read according to a value stored in a bit position, indicated by the node mask length, to the bit position + p-1.

6. The network forwarding device according to claim 4 wherein said next-path searching device provides a flag in data that is read first for each node, said flag indicating whether or not a path is

allocated to the node, reads the flag first, and does not read path information for a node to which the path is not allocated.

7. The network forwarding device according to claim 1 wherein said network forwarding device is a router.

8. A network forwarding device connecting a plurality of networks comprising:

a port to which one of said networks is connected;

a network interface connected to said port and controlling an interface with the network connected to said port; and

a routing processor connected to said network interface via an intra-device communication line and performing routing of a packet received from said network interface;

wherein said routing processor includes:

path information holding means; and

next-path searching means for calculating, based on path information held in said path information holding means, a path to which the received packet is to be forwarded next

wherein said next-path searching means searches for a next path using a 2-branch tree search in which a destination address is checked, one bit at a time, beginning with a highest-order bit, performs a search for a match of an address and a mask by

associating a bit position to be checked with a mask length, expands 2^m m-bit (m is a natural number) mask nodes into fixed positions in storing means, makes each of the m-bit mask nodes correspond, one to one, with a value that may be represented by bit 0 to bit (m-1) of the destination address, and selects one of the m-bit mask nodes according to a value represented by bit 0 to bit (m-1) of the destination address.

9. A network forwarding device connecting a plurality of networks comprising:

a port to which one of said networks is connected;

a network interface connected to said port and controlling an interface with the network connected to said port; and

a routing processor connected to said network interface via an intra-device communication line and performing routing of a packet received from said network interface;

wherein said routing processor includes:

path information holding means; and

next-path searching means for calculating, based on path information held in said path information holding means, a path to which the received packet is to be forwarded next

wherein said next-path searching means searches for a next path using a 2-branch tree search in which a destination address is checked, one bit at a

time, beginning with a highest-order bit, stores 0- to k-bit mask 2-branch tree nodes in internal storing means of said next-path searching means, a number of bits of each of said nodes being equal to or smaller than a predetermined number, stores (k+1)bit or longer mask 2-branch tree nodes in external storing means of said search means, and performs pipeline processing for 0- to k-bit mask node search processing and (k+1)bit or longer mask node search processing.

10. A network next-hop search method for use in a network forwarding device connected to a plurality of network and transmitting a packet received from one of said networks to a next hop based on path information

wherein, in a 2-branch tree search in which a destination address of the received packet is checked, one bit at a time beginning at a highest-order bit, p (p is an integer equal to or larger than 2) levels are combined into one 2^p-branch tree to perform a search of the p levels of the 2-branch tree as a one-level search.

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